

product user guide

mabey hire
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Title

Culvert Puller (10 Tonne)

Issue
15

Date
April 2015

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1. Introduction

This booklet is intended to provide basic information for users of the Mabey Hire Type CP01, CP02 & CP03 Culvert Pulling machines and to draw the client's attention to the practical aspects of handling, assembly, installation and use which need to be considered in compiling method statements for a safe system of work. In particular, the client's attention is drawn to the size and weights of the machine components and the need for planning the lifting operations involved.

All major components of the machines have lifting points for safe slinging. It is assumed that clients are familiar with general safe practices applicable to the installation of pre-cast box culverts. Users should ensure that the height, length and pulling capacity of the machines are sufficient for the work to be carried out.

The Culvert Pulling machines are designed to pull pre-cast box culvert sections and are not intended for other purposes.

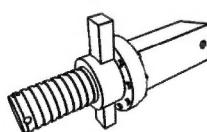
The CP01, CP02 & CP03 Culvert Pulling machines are manufactured by Mabey Hire Ltd, Scout Hill, Ravensthorpe, Dewsbury, West Yorkshire WF13 3EJ. Refer to Appendix A for details of our Site Demonstrator service.

2. Design

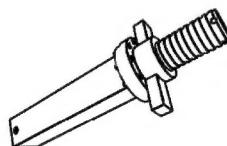
The CP01, CP02 & CP03 Culvert Pulling machines have a maximum pull capacity of 10 tonne.

3. Component Identification

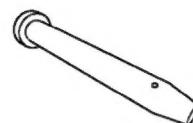
Note: All components are common to each type of machine except where shown otherwise.



**Machine type CP02
Bottom Inner assembly**
Code: CP10-B/INN
Weight: 40.0 kg

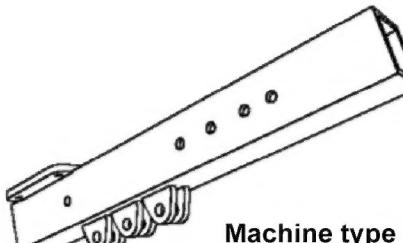


**Machine type CP02
Top Inner assembly**
Code: CP10-T/INN
Weight: 60.0 kg



**Machine type CP02
Outer / Inner Pin**
(25 dia x 200 long)
Code: CP10-027
Weight: 0.8 kg

Machine Type CP02			
Code No.	Actual Body Length (mm)	Culvert Working range (mm)	Weight (kg)
CP10-018	877	1400 - 1775	60.0
CP10-019	1252	1775 - 2150	80.0
CP10-020	1627	2150 - 2525	100.0
CP10-021	2002	2525 - 2900	135.0
CP10-022	2377	2900 - 3275	161.0
CP10-055	2752	3275 - 3650	194.0



**Machine type CP02
Outer Body**

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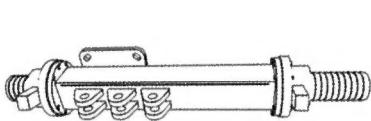
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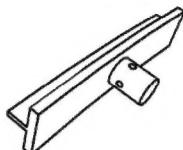
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3. Component Identification Cont'd

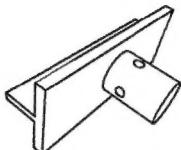
Note: All components are common to each type of machine except where shown otherwise.



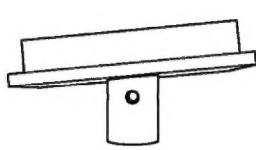
**Machine type CP01
1300-1400 Body &
Screw assembly**
Code: CP10-017
Weight: 120.0 kg



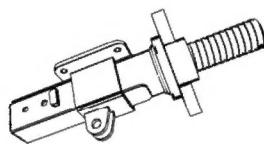
**Machine types CP01 &
CP02 Centre Shoe**
Code: CP10-002
Weight: 15.2 kg



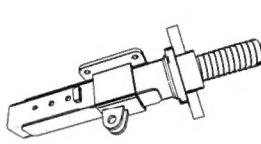
**Machine types CP01 &
CP02 Top Shoe**
Code: CP10-003
Weight: 8.1 kg



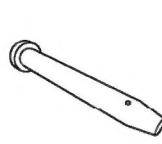
**Machine types CP01 &
CP02 Bottom Shoe**
Code: CP10-004
Weight: 8.1 kg



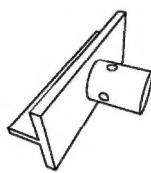
**Machine type CP03
825-1050 Body &
Screw assembly**
Code: CP10-048
Weight: 76.0 kg



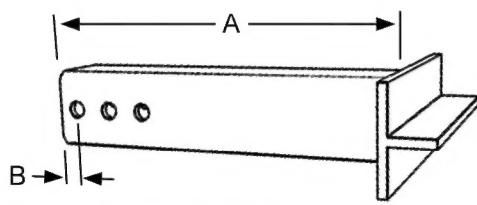
**Machine type CP03
975-1425 Body &
Screw assembly**
Code: CP10-032
Weight: 80.0 kg



**Machine type CP03
Body / Inner Pin**
(20 dia x 195 long)
Code: MHB-04
Weight: 0.6 kg

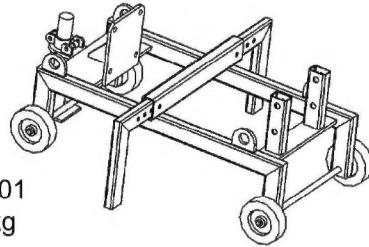


**Machine type CP03
825-1425 Bottom Shoe**
Code: CP10-035
Weight: 6.7 kg

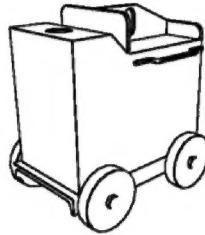


**Machine type CP03
Top Inner Assembly**

Machine Type CP03					
Code No.	Culvert Working range (mm)	Dim. A	Dim. B	No. of Holes	Weight (kg)
CP10-049	825 - 855	190	100	1	8.0
CP10-050	860 - 950	225	40	3	9.0
CP10-051	960 - 1050	325	40	3	11.0
CP10-033	975 - 1125	325	25	3	11.0
CP10-034	1125 - 1275	475	25	3	14.4
CP10-056	1275 - 1425	625	25	3	17.8



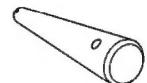
Chassis
Code: CP10-001
Weight: 104 kg



Wheeled Pump
Code: SSBA-003
Weight: 87.0 kg (full)



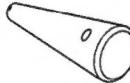
Cylinder
Code: CP10-005
Weight: 93.0 kg



**Cylinder Support Pin
(25 dia x 400 long)**
Code: CP10-006
Weight: 1.5 kg



**Shoe Pin
(15 dia x 130 long)**
Code: CP10-007
Weight: 0.2 kg



**Tow Bar Pin
(30 dia x 125 long)**
Code: CP10-008
Weight: 0.7 kg

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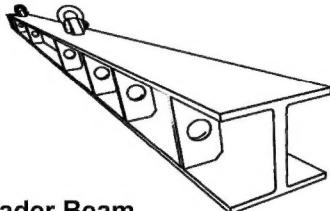
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3. Component Identification Cont'd

Note: All components are common to each type of machine except where shown otherwise.



Spreader Beam

203x203x52 kg/m U.C

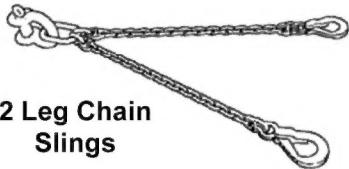
Code No.	Length (mm)	Weight (kg)	Pulling Centres (mm)
CP10-070	1200	72	1 on CL
CP10-071	1600	96	1 on CL, 1000
CP10-072	2000	125	1000
CP10-073	2350	141	1000
CP10-074	2400	144	1500, 1600
CP10-075	2600	156	1000, 1200, 1600
CP10-076	2600	156	1600
CP10-077	2850	170	1050, 1200, 1450
CP10-078	3000	177	1200
CP10-079	3000	177	750, 1200
CP10-080	3100	183	1200
CP10-081	3500	203	1200
CP10-082	3500	203	1000, 1400
CP10-083	3500	203	1500
CP10-084	3600	209	1200, 2800, Angle
CP10-085	4000	230	1500
CP10-086	4000	230	1200, 1500
CP10-087	4000	230	1500, 2500
CP10-088	4500	254	1500, 2000, 2500
CP10-089	4500	254	1500, 2000
CP10-090	5000	285	1000, 2500
CP10-091	5000	285	2000, 2500
CP10-092	5500	311	2500, 2800
CP10-093*	7000	781	3000
CP10-094*	7000	781	2500, 3000
CP10-095	2850	170	1200

*254x254x107 kg/m U.C.



Tow Bar

Code No.	Hole Ctrs (mm)	Weight (kg)
CP10-031	1000	16.0
CP10-038	1400	18.1
CP10-009	1885	21.5
CP10-029	2000	22.4
CP10-039	2800	28.7
CP10-010	3770	35.7
CP10-030	4000	37.5



2 Leg Chain Slings

Code No.	Eff. Leg Length (mm)	Weight (kg)
CP10-043	1000	32.0
CP10-012	2030	38.0



Single Leg Chain Slings

Code No.	Eff. Leg Length (mm)	Weight (kg)
CP10-040	600	10.3
CP10-046	1000	15.0
CP10-013	1600	18.0

Miscellaneous Accessories

- Hose / Bridal Assembly - CP10-015
- 3.0m Hose Extension - CP10-060
- M12 x 120 long Bolt & Nut - CP10-036
- Hose / Shut off valve assy - CP10-045

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4. Connection Details

- Body to Chassis - 4 No. M20 x 75 long Gr 8.8 Galv bolts (SHBP-M20x75)
- Outriggers to chassis - 2 No. M16 x 80 long Gr 8.8 Galv bolts (JCBP-045)
- Cylinder to Body - 1 No. Tow Bar Pin (CP10-008) + 'R' Clip
- Cylinder to Tow Bar - 1 No. Tow Bar Pin (CP10-008) + 'R' Clip
- Tow Bar to Tow Bar - 1 No. Tow Bar Pin (CP10-008) + 'R' Clip
- CP03 Body & Screw assy (CP10-032) to CP03 Top Inner assy (CP10-033/034) - 1 No. Manhole Brace Pin (MHB-04) + 'R' Clip
- CP03 Body & Screw assy (CP10-048) to CP03 Top Inner assy (CP10-049/050/051) - 1 No. Manhole Brace Pin (MHB-04) + 'R' Clip
- CP03 Bottom Shoe (CP10-035) to CP03 Body & Screw assy (CP10-032/048) - 1 No. M12 x 120 lg Gr 8.8 bolt (CP10-036)
- CP01/02 Centre Shoe (CP10-002) to CP01 Body & Screw assy (CP10-017) OR CP02 Bottom Inner assy (CP10-B/INN) - 1 No. Shoe Pin (Code CP10-007) + 'R' Clip
- CP01/02 Top Shoe (CP10-003) to CP01 Body & Screw assy (CP10-017) OR CP02 Bottom Inner assy (CP10-B/INN) or CP02 Top Inner assy (CP10-T/INN) - 1 No. Shoe Pin (Code CP10-007) + 'R' Clip
- CP01/02 Bottom Shoe (CP10-004) to CP01 Body & Screw assy (CP10-017) OR CP02 Bottom Inner assy (CP10-B/INN) - 1 No. Shoe Pin (Code CP10-007) + 'R' Clip
- CP02 Top Inner assy (CP10-T/INN) to CP02 Outer Body (CP10-018/019/020/021/022) - 1 No. Outer/Inner Pin (CP10-027) + 'R' Clip
- CP02 Bottom Inner assy (CP10-B/INN) to CP02 Outer Body (CP10-018/019/020/021/022) - 1 No. Outer/Inner Pin (CP10-027) + 'R' Clip

5. Stacking and Handling

- Suitable lifting equipment of adequate lifting capacity should be provided for off-loading, pre-assembly work, installation and dismantling.
- Slinging should always be carried out by suitably experienced and competent personnel.
- Weights of components are given in Section 3.
- Return equipment as supplied from Mabey Hire depot.

6. Transportation

- Ensure cylinder is fully retracted.
- Ensure outriggers are fully closed and bolted to chassis.
- Ensure rear vertical stabiliser is fully retracted.
- Ensure all equipment is loaded to the satisfaction of the lorry driver and securely restrained to the vehicle bed.

7. Site Assembly & Culvert Installation

There are two typical assemblies:

7.1 Single Culvert Pulling machine with 2 leg Pulling Chain

7.1.1 Refer to Section 9 for typical assembly details.

7.1.2 The Culvert Puller should be positioned in the centre of the culvert, and may be stabilised using the rear vertical screw and side mounted adjustable outriggers as required.

7.1.3 Ensure the body is vertical to the chassis - adjust by releasing 4 No. M20 bolts if necessary.

7.1.4 Vertical adjustment should be made as follows:

- On type CP01 machines adjust the screws at the top and bottom of the Body and Screw Assembly to secure each shoe into the recess between the culvert sections.
- On type CP02 machines initial adjustment should be made by the incremental hole positions between the Outer Body and the Top Inner Assembly and then the top and bottom screws should be used for the final adjustment to secure each shoe into the recess between the culvert sections.
- On type CP03 machines fitted with Body & Screw Assembly CP10-048 and Top Inner Assembly CP10-049 adjustment is made by the bottom screw only. On all other type CP03 machines initial adjustment should be made by the incremental hole positions between the Body and Screw Assembly and the Top Inner Assembly and then the bottom screw should be used for the final adjustment to secure the shoes into the recess between the culvert sections.

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7. Site Assembly & Culvert Installation Cont'd

- 7.1.5 Select one of three connection points (the CP03 machines have only one connecting point) and pin the cylinder tube into the body using 1 No. 30 dia tow bar pin and 'R' clip. Ensure the cylinder couplings are facing upwards and the cylinder tube is resting on the support bar at the front of the chassis.
- 7.1.6 Connect both hose/shut off valve assemblies between the air pump and cylinder, and connect the pump to a suitable air supply (100psi @ 14 cu.ft/min).
- 7.1.7 Follow the procedure for extending / retracting the cylinder in Section 8.
- 7.1.8 When the cylinder has been sufficiently extended and the next culvert section is in position, lift the spreader beam complete with 2 leg pulling chain to the required height and attach to the cylinder piston rod using the bow shackle fitted to the master ring.
- 7.1.9 Check the top and centre shoe are in position and the body is screwed up tight.
- 7.1.10 Check all pins, 'R' clips and bolts are in position.
- 7.1.11 Check the chassis is in line with the culvert.
- 7.1.12 The cylinder can now be retracted to pull the culvert section into position.
- 7.1.13 Tow bars are supplied which can be fitted between the cylinder and pulling chain as required, as further culvert sections are placed. The short tow bar should be used first. This is then removed and replaced with the long tow bar, and then both tow bars can be used together. This will enable 4 No. culvert sections to be placed before moving the chassis. All tow bar connections are made using the tow bar pin and 'R' clips.

7.2 Two Culvert Pulling machines with two single leg Pulling Chains

- 7.2.1 Refer to Section 9 for typical assembly details.
- 7.2.2 Each Culvert Puller should be positioned either side of the culvert centreline at the same centres as the pulling points on the spreader beam, and may be stabilised using the rear vertical screw and side mounted adjustable outriggers as required.
- 7.2.3 Note that the bottom shoes may be slightly angled, and should be positioned to reflect the slope on the culvert base. Ensure each body is vertical to its chassis - adjust by releasing 4 No. M20 bolts if necessary.
- 7.2.4 Vertical adjustments should be made in the same way as described in the section on vertical adjustment for Single Culvert Pulling Machines.
- 7.2.5 Select one of three connection points (the CP03 machines have only one connecting point) on each body and pin one cylinder tube onto each body using 1 No. 30 dia tow bar pin and 'R' clips. Ensure the cylinder couplings are facing upwards and the cylinder tube is resting on the support bar at the front of the chassis.
- 7.2.6 Connect both hose/bridle assemblies between the air pump and cylinder, and connect the pump to a suitable air supply (100psi @ 14 cu.ft/min).
- 7.2.7 Follow the procedure for extending/retracting the cylinder in Section 8.
- 7.2.8 When each cylinder has been sufficiently extended and the next culvert section is in position, lift the spreader beam complete with 2 No. single leg pulling chains to the required height and attach each chain to it's corresponding cylinder using the bow shackles provided.
- 7.2.9 Check all four shoes are in position and each body is screwed up tight.
- 7.2.10 Check all pins, 'R' clips and bolts are in position.
- 7.2.11 Check each chassis is in line with the culvert.
- 7.2.12 The cylinders can now be retracted to pull the culvert section into position.

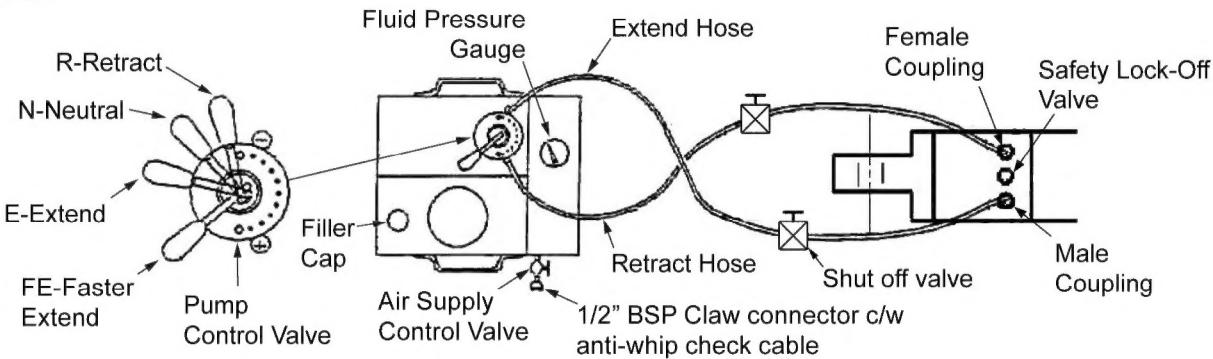
Note: Each hydraulic hose is fitted with a shut off valve so that each cylinder can be isolated if required, e.g. if one cylinder is moving ahead of the other or if the culvert section requires "squaring up".

- 7.2.13 Tow bars are supplied which can be fitted between each cylinder or pulling chain as required, as further culvert sections are placed. The short tow bar should be used first. This is then removed and replaced with the long tow bar, and then both tow bars can be used together. This will enable 4 No. culvert sections to be placed before moving the chassis. All tow bar connections are made using the tow bar pin and 'R' clips.

8. Mechanical Pump Details and Procedures for Extending / Retracting Walings

8.1 Introduction

It is advisable before commencing installation to read the notes below to become familiar with the procedures involved. The diagrams below show the pump control, gauge, hose connections and safety lock off valve referred to in the procedures.



8.2 Preliminaries

- Check there is sufficient of the Mabey Hire shoring fluid in the tank. Only Mabey Hire shoring fluid can be used.
- Set the pump control valve to 'Neutral'.
- Connect the pump to a suitable air supply (100psi at 14 cu ft/min), fit the anti-whip check cable to the air supply hose and open the air supply control valve on the pump.
- Purge the hoses of air. To do this connect the hoses together and run the pump for a few seconds with the control valve set to 'extend'. When satisfied that any air has been expelled, set the pump control valve to 'neutral'.
- At no time must the pump be left operating whilst unattended.

8.3 Mabey Hire Shoring Fluid

The pump is normally supplied with a full tank of premixed fluid. If the fluid is separately supplied 'neat' in 5 litre orange coloured containers, it should be poured into the pump and cold clean water added according to the prevailing weather conditions (see table to the right). Protective gloves should always be worn when handling shoring fluid.

Note: A shoring fluid safety data sheet is available on request from Mabey Hire Ltd.

Temp Range (Degrees C)	Shoring Fluid (litres)	Water (litres)
Above 0	5	20
-6 to 0	10	20
-10 to -7	15	15
-10 and below	Neat Only	-

8.4 Procedure for extending the cylinder

- Ensure the cylinder is safely pinned to the body using 1 No. 30 dia. tow bar pin and 'R' clips, the couplings are facing upwards and the cylinder is horizontal and supported at the front of the chassis.
- Set the pump control valve to 'Neutral' and ensure the air supply valve is open.
- Connect the pump hoses between the pump and cylinder.
- If two cylinders are being used, attach an additional hose between each bridle and cylinder.
- Ensure the safety lock-off valve on the cylinder is open (by rotating anti-clockwise).
- Open all shut off valves on the pump hoses.
- Set the pump control valve to 'Extend'.
- Allow the cylinder to extend to the required length.
- If two cylinders are being used and it becomes necessary to isolate one cylinder (i.e. if one cylinder is extending ahead of the other), then close the shut off valve in the extend hose connected to that cylinder.
- Shut down the pump by closing off the air supply valve and set the pump control valve to 'Neutral'.
- The pulling chain and / or tow bar can now be attached to the cylinder.

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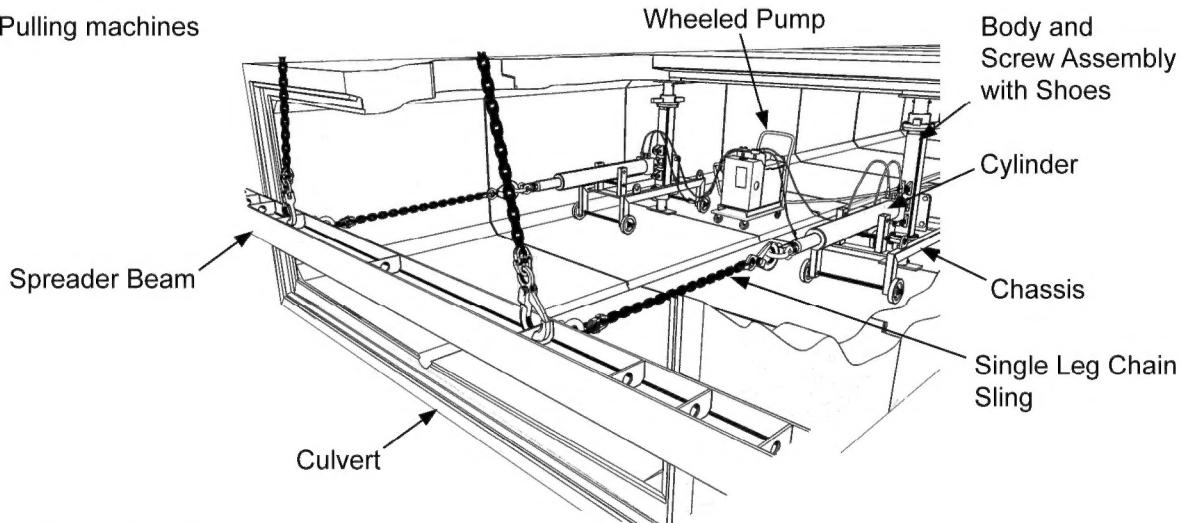
8.5 Mechanical Pump Details and Procedures for Extending / Retracting Walings Cont'd

8.5 Procedure for retracting the cylinder i.e. Pulling the culvert

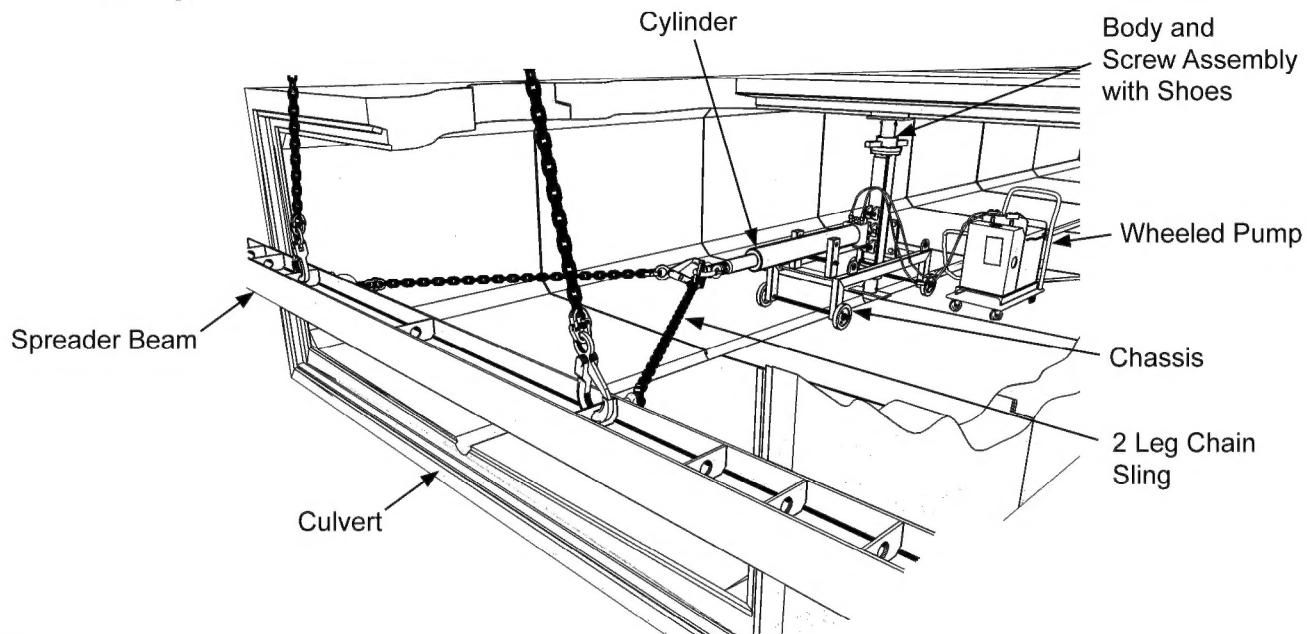
- Ensure the culvert spreader beam, pulling chain and tow bar if required are all in position and all pins and 'R' clips are fitted and secure.
- Set the pump control valve to 'Neutral' and open the air supply valve.
- The pump hoses should still be connected. If not, follow steps above.
- Set the pump control valve to 'Retract' to pull the culvert into position.
- If two cylinders are being used and it becomes necessary to isolate one cylinder (i.e. if the culvert is not being pulled squarely), then close the shut off valve in the retract hose connected to that cylinder.
- On completion of the retraction and when the culvert is in position, close off the air supply valve and set the pump control valve to 'Neutral'.

9. Typical Assembly Details

9.1 Two Culvert Pulling machines



9.2 Single Culvert Pulling machine



10. General

Since our policy is one of continual improvement, components may vary in detail from the descriptions given in this publication.

User Information Appendix A : Provision of a Mabey Hire Site Demonstrator

Mabey Hire can, subject to availability, offer the services of a Site Demonstrator. However, the Customer should note the following :-

A1. The Customers Responsibilities

A safe system of work remains the Customers responsibility at all times. It is his responsibility to prepare for, organise and direct the operation including :-

- A1.1 Site induction for the demonstrator.
- A1.2 Preparation of a method statement.
- A1.3 A risk assessment.
- A1.4 Selection of lifting equipment and any other equipment required to undertake the work.
- A1.5 Positioning of the crane or lifting appliance.
- A1.6 Banking the crane.
- A1.7 Slinging the components.
- A1.8 Assembling the components and installing them.

A2. Activities which the Mabey Hire Demonstrator is authorised to carry out

Mabey Hire Demonstrator is authorised to :-

- A2.1 Assist in identification of Mabey Hire components.
- A2.2 Explain how they fasten together.
- A2.3 Point out slinging points and special methods of lifting as noted in the user information.
- A2.4 Demonstrate how to attach hoses and use pumps to extend/retract hydraulic braces.
- A2.5 Draw attention to the content of the user information.
- A2.6 Clarify queries with Mabey Hire scheme drawings.

The Demonstrator is NOT AUTHORISED to 'take over' or direct the installation.

To : Mabey Hire Limited

(Please return this completed form to the Mabey Hire depot supplying the equipment. Contact details for all the Mabey Hire depots are available both on-line at www.mabeyhire.co.uk/depot-directions/ and within our brochures)

From (Company Name) _____ Site (Address) _____

Tel.No._____ Fax No. _____

Re : Provision of a Mabey Hire Demonstrator on site

We confirm receipt of your User Information Appendix A - and that we would like to request the services of your Demonstrator on the following date(s) _____

Signed _____ Name (print) _____ Date _____